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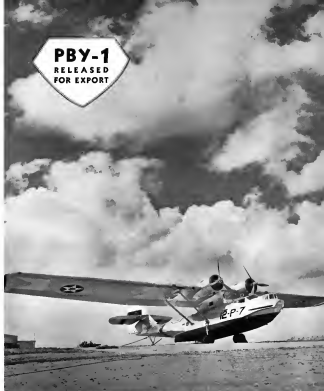
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THE
BIGGEST AMERICAN
AERONAUTICAL MAGAZINE

AVIATION

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Edith E. Hall

Vice-President

E. Paul Johnson

Editor

Leslie E. Neville

Managing Editor

Charles G. Cleveland

News Editor

Edith Ramsey

Books Editor

Charles F. McGovern

Public Cost

Paul Weiss

Washington

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foring it is flight by snagging a succession of our rubber tire of gradient from a speeding automobile by the flying pole route. We don't know quite what it proved, but we don't doubt that Mrs. Hudson and Jan Finney, who helped on the ground, had a lot of fun at it.

THREE DAYS BEFORE DR. ANN M. J. Austin (president of Cleveland's Austin Company; holders of aircraft licenses) took off in Florida recently, looked in briefly at his Cleveland office, hoped for California for a conference with his Texas Coast people, got in a round of golf in Houston, and dropped in at Wake Island for a little fishing—all in a week's time.

AND PERSONALLY STUNTS THAT DO "public relations" would even dare suggest. —Recently Miss Peggy Keys arrived in Los Angeles via American Airlines; she got there only to find on arrival that someone at a previous stop had accidentally carried away the suitcase in which she had neatly stored her evening apparel. No Lady Godiva, Miss Keys merely avoided the bustle, who returned for a reasonably complete set of clothes.

HEARD'S CASE, for any of our readers who are anxious to write. An unassisted look and short story contest has been sponsored, sponsored by the Women's International Association of Aeronautics and the National League of America Inc. Women, both of Los Angeles. Prizes are offered for (a) a book of 60,000 to 75,000 words featuring aviation and aeronautics; (b) a short story, 2,000 to 3,000 words, on the same subject; and (c) a child's story (not an aviation story at all) on an aviation theme, 1,500 to 2,000 words. Contest opens May 1, closes Nov. 1, 1937. For rules and other de-



NO MISTAKE

The business is built to full-scale PWA specifications, but also is designed by her grandson—Robert Hudson, 17 years old, 410 pounds, 4 feet 7 inches in his stocking feet. He flew and is John R. Hudson, Hudson's son in "The Deliberate Man in the West."

1934 with Mrs. Helen Bessie, 217 South Lorraine St., Los Angeles.

hacker awarded a gold plaque to Mr. John R. Hudson, New York attorney, No. 1 air parasite on EAL's Washington Merry-Go-Round. Mr. R. Hudson averaged three round trips a week all year for a total of some 14,000 miles.

As a winner in our 5,000-mile cruise with Eastern Air Lines collecting ideas for the story that appears on page 30, Eddie Rabinovitch landed on in named the Third Annual Dinner of EAL, presented at New York's Park Central Hotel, March 21. Feature of the evening were five "dishes" highlighting air line operations by EAL employees. On the most serious side was the reaction of pilots, passengers and engineers from Duke Merrill's forced landing at Port Jervis in December last. Also, Captain Rich-

As a word of warning to our readers: If you should receive a telephone call or a visit from anyone who claims to be a photographer regarded by Aviation or McGraw-Hill Publishing Company, to take your personal photograph do not be misled by Aviation or McGraw-Hill Publishing Company does not use such methods to secure photographs of individuals.



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AVIATION for May, 1937 ★

"Per Ardua ad Astra"

A misadventure accidentally dropped in a cockpit, a jammed control column and 11 persons are plunged into the waters of San Francisco Bay to drown within sight of their destination.

Yes, accompanying on adverse landing edges in quarters were before represented, shows a loaded transport out of control, wrecks it on a Presidio. Thirteen people die. A \$90,000 machine is reduced to junk.

Every accident that takes a toll of human lives, be it on the ground, at sea, or in the air, is to be deplored. We in the aviation industry can never rest for a moment until air transport is the subject of all modes of conveyance. Over and over again we have said that safety has only an 100 per cent performance by every member of this industry, from the lowest Messenger boy in the factory to the highest executive in operating companies. In few other human activities is direct responsibility for safe performance so widely distributed. In few other fields of activity are the effects of individual carelessness or mistake so widespread or so disastrous.

The only possible thing that can be salvaged out of the shocking accident that have occurred recently is the knowledge of how to prevent their recurrence. In these two cases the facts are plain, the method of attack for correction is indicated. A week after the San Francisco accident, the circumstances surrounding it were duplicated, fortuitously without fatal results, and a clue was given that solved the mystery and yielded the solution for prevention. At Pittsburgh, by sheer coincidence, independent eye witnesses were at hand, and sensitive conditions were such that evidence was preserved that pointed unerringly to the cause. In the first case a simple defect eliminated all possibility of recurrence, and in the second, the designers were at work almost before the first had ended, to state dangerous advice long before impossible.

Then progress. Thus we learn—But the price we pay is high.

Old Anxy Game

WE WERE SITTING IN THE AIRPORT RESTAURANT IN K...—having a quick cup of coffee with the pilot who had just brought in to down the south. "Listen glad to get down," he said. "How come?" we asked. We knew that we had been going it hard for over an hour, but there had been plenty of coffee at



the airport, and no alarming symptoms anywhere visible. But it seemed that when we were in the thick of it, X—— had noticed that two Army bombers had just taken off, southbound, along the runway, and had explained to him a flight plan. Somewhere in the "loop" we had missed them,—fortunately. And that was that.

Three days later, flying southbound over another route, a pilot who was determined to be vague told us another story. Less than a week before he had been flying normally along his run one night when suddenly the air all about him was filled with airplanes. There was nothing to do but hold his course, and fortunately nothing happened, but he had flown right through a whole formation of bombers on an overdue cruise. Five minutes later one of his ground stations advised for him to be on the lookout for a flight of 24 Army machines thought to be in his vicinity. The report on the subject may be incorrect.

Tales of this sort have been cropping up with alarming frequency of late, and with the great increase back in commercial and military flying that is an immediate prospect, it is only a question of time until the word "fortuitously" twice used above will turn up with a negative prefix. So far a line has been laid rather than good management that has prevented a serious angle in the air. The Army people may feel that they must consider these war games with a certain degree of secrecy, but short of an actual national emergency, no military measures are worth risking the credit of a plane-load of citizens going about their business on a commercial airline. The Army should either restrict its practice flying to areas of the country surrounded by regular obstacles, or else should be required to file full and complete flight plans with the airlines over which the planes expect to fly in plenty of time so that all pilots in the air will receive ample warning and lay their plans accordingly.

Preferred Promotion

COURAGE, ABILITY, AND CLEVERNESS ARE to be desired as aviation personnel, but every one will agree that, as in any other industry, the essentials are training, loyalty, and experience.

Our aeronautic schools are picking up an outstanding performance in footing well trained men into the industry, and obviously such training must be increased. The loyalty is gained only through fair treatment of employees, and the benefits of experience are made available only when work loyalty has been engendered so will prompt the employee to give long service with one firm.

Intelligent fair treatment should lead a firm to give preferred attention to the employee who possesses superior training. Where graduates of accredited aeronautic schools are checked along with men not so trained, it is to be expected that benefits will accrue to the trained men are given every opportunity to learn the background of the few employees that, in fact, are what department day

work best, and to progress in position so that they and their employer may both reap the full rewards of their special training. For as the final analysis it is men and not money that solves the problems of depression and other emergencies which all industries must meet.

Training, loyalty, and experience have built the aviation industry to its present position and will carry it to its rightful development. To capitalize fully on these three qualities in an employee the several units of the aviation industry will do well to consider seriously organizing a preferred promotion system for men with special training.

Back to the Seat of the Pants?

FOR YEARS WE HAVE BEEN at the front rank of the changing attitude which our new pilots have assumed that promises to make the flying of aircraft safer, less dependent upon what the pilot can see outside the airplane. We have tested the advent of accurate navigation instruments, of better radio devices, of automatic pilots and other aids. But do we propose to sweep for a seat on the instrument bench at this stage of the game? But we do want to pass along a suggestion that has come to us from a number of pilots recently that seems to have some thought.

Flying, like good golfing, good figure skating, or good light-wise welding, calls for the development of a highly specialized set of reflexes that are slowly acquired, but rapidly frozen "set ones" may be maintained only by constant practice. In flying small steps with the minimum of instruments the pilot develops that touch sense that tells him instantly of incorrect speed or altitude. As steps become larger, the feeling of intimacy with the machine is more difficult to retain, and, instead of cultivating it to the greatest possible extent, the natural tendency is to rely more and more on the instruments. All of which is fitting and proper, but the danger lies in taking it too far, in becoming so dependent upon instruments and other flight aids that all "feel" of the ship is merely lost. We are fully aware how undesirable a pilot's flight sense may be at best, but now and again accidents do arise when instruments go out, and the pilot may have nothing left except his "feel" of his ship. If he has permitted that sense to become dulled through disuse, he may find himself in a bad spot.

No suggestion that for checking our instruments overhead and giving back entry to the undesirable wilderness that we transmitted via the seat of the pants, but there is some sense in the suggestion that all pilots should practice regularly some "make the land" flying without instruments. Necessary, of course, are carefully selected conditions, and constant supervision of a check pilot. Some pilots admit doing this reluctantly in order not to lose that "feel" that they believe necessary for safe handling of their ships. Not a bad idea, we think, and one that should be studied carefully by all operators.



1. Col. Lindbergh returns his Miss Robert of Sweden (White World). 2. No. 1 of the DC-3 for TWA. 3. Frank Potts shows his speed (Motel). 4. Days in Western Canada. 5. Thorton wins the Western Derby (Harris & Harris). 6. Taylor receives Gold production after World War II. "K2 Air" Service in the British Empire (Carter) Service Eastings. In the Alexandria (Gibbs). For further news see page 16.



With The Great Silver Fleet

Eastern Air Lines looks back with pride over the ten-years of its existence.



NO serious extent of the thought that raced through the mind of a certain, lean, hard-bitten fighting pilot of 1918, when, resting and leaning through waist-mounted slots, he watched the distant passing of a battleship would release a stream of lead into a modernized ship ahead. Her career to speculate upon why that pilot did not think about it? Captain Eddie Rickenbacker of the days of the A.E.F. ever showed his thoughts and emotions to range beyond the next day's parade; it is endlessly doubtful if his wildest speculations favored the day when he would sit guiding Nations to release great silver battles, loaded with passengers and freight, on daily schedules from the Atlantic to the Gulf, from the Great Lakes to the Florida Keys.

Today, Captain Rickenbacker runs Eastern Air Lines with that same combination of gravity and the ad-

ility to make accurate decisions quickly and to make them stick that made him popular in France. To the hundreds of employees up and down the line he is "The Captain," and the title that used to not put a hangover from army days.

In the earlier stages of its history, Eastern Air had suffered growing pains, but not always translated as a homogeneous unit, had had frequent internal political troubles. Such situations, always dangerous in any organization, may be told in an article. Reorganizing the airplane, Rickenbacker's first concern was to get everyone working in the same direction all of the time. In the two years at his administration, he has succeeded in creating an esprit de corps in the system that has never been known before.

Perhaps the best way to see just how he has done it is to watch him at



work in one of E.A.L.'s operations meetings held monthly in New York. Here all department heads—from Messrs. from Atlanta, from New Orleans, from Chicago,—sit down to discuss their troubles. Here every matter relating to the smooth control of passengers or policy is thrown on the table for discussion. Inter-departmental difficulties are worked out, plans for the future are made, budgets are balanced. Everyone may have his say, openly, without fear or favor,

and careful records are kept (available to all) so that there can be no misunderstanding, no temptations to "pass the buck." All departments are required to make written monthly reports which become a part of the record.

At the head of the long table sits the Captain, in front of him are placed the departmental reports, alongside the Recording Angel in the person of an efficient secretary. Down one side of the table: Paul Bonham, assistant general manager and general traffic manager; Selby Shawson, operations manager; George Gardner, assistant operations manager; Marie Sullivan of the Women's Department; Robert Hunsington, chief air navigation engineer; Henry Stevin, instructor on Lake Trainer. Flight Captains Larry Palast and J. H. Brown (all flight engineers in New York on working days must attend), Bertha Griffith director, public relations and Ping Ferey, publicist, discuss the other side. Dan McElroy, communications superintendent; Don Charles Frosch, chief engineer; Leslie Trueman, superintendent of maintenance; John Deak, purchasing

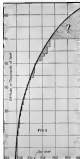
agent; Walter Avery, superintendent of passenger service; J. E. George, chief meteorologist; Ned McKeown, chief dispatcher; Richard Davis, Woodie Williams Division, and J. J. Mohr, treasurer.

Departments after department reports,—up and down the table goes the discussion. What is the last word on delivery dates for the eight new Douglas DC-3's? How is the Lake Trainer set-up at Newark proving along? Shall the Skowron test flight-training plane be based at Miami? What about air conditioning the planes for the summer season? What about some new landing strips? Shall there be a mid US in the city? (Actually, people,—witness closely—release to ride in and fly). What should the ad reviewer be put? What other circles for the new ship? What about the telephone connections in Chicago? Who will buy the last Conder? How can the ship be kept cleaner? Should baggage handlers take tips? How about some new baggage tags? How are the new radio sets coming along?—and so on, far into the night, if necessary, until every (Two to page 70)



How High?

IV. the Ultimate Ceiling of Aircraft



The Time-Effort curve is useful in determining the probable highest limit to conventional fighter designs such as being approached.

After the tremendous progress of the aircraft industry during the past two years has been the prediction of atmospheric flight. Many speculations have been made as to the maximum altitudes which will be reached by the conventional airplane of today.

It is of interest, therefore, to arrive at some conclusion as to the maximum practical limits which can be reached by the conventional aircraft of today. Furthermore, one of the major trends of today is the maximum altitude reached by aircraft. A prediction of the maximum altitude which aircraft will reach in the future will certainly be a convincing factor as to the maximum practical altitude to be used in air transport. It is the purpose of this article to establish this maximum.

Just recently this altitude record was broken by Squadron Leader Swire using a specially designed plane built by Bristol, and an altitude of approximately 50,000 ft was attained. This record together with the records established over the previous days of flying have been placed in Fig. 1, representing altitude against time. It will be seen from this figure that the steady increase of record al-

titude has caused a steady drop and the curve representing this tendency clearly indicates an approaching maximum above beyond which the conventional airplane of today will not soar.

Since a tendency did not exhibit itself in the similar curves made up for maximum speed and range presented in previous articles of this series. Although a greater proportion of the energy of the aircraft industry has, in the past seven or eight years, been devoted to the building of aircraft designed for more immediate practical importance, such as for commercial and military purposes, none the less all of the record advances have resulted from the same dominant support. We would suggest, therefore, that the major trends would keep pace with our earlier and if there is a discrepancy in their advance we should like to determine the reason.

In order to study the ultimate ceiling to be attained by aircraft, we must first determine what factors are most important in determining this limit and the extent to which they affect the limit. When an airplane is flying at its absolute ceiling, all of

its thrust horsepower available is used in overcoming drag. Thus the two most important factors which must be recognized are the thrust horsepower available and the drag.

In the second article of this series a figure was presented showing the variation of air density, along with numerous other factors, with relation to altitude. It will be noted from this figure that at 50,000 ft. the air density is only one-tenth of that at sea level. This means that an airplane flying at 50,000 ft. would have only one-tenth of the parasite drag and seven times the induced drag which it would experience if it were flown at the same speed as sea level.

Furthermore, a simple calculation will show that for an "ideal" airplane, that is, one in which the phenomenon of burbling or stalling does not occur, the total drag is made up of three-fourths induced drag and only one-fourth parasite drag. In the case of an actual airplane this proportion may become as low as two-thirds induced drag and as high as one-third parasite drag. It is clear from the above that the induced drag becomes by far the more important of the two factors.

Figure 2 shows the variation of the



By
Dr. Norton E. Moore
*Associate in Aeronautics
California Institute of Technology*
and
W. C. Rockefeller
*Aerodynamics Engineer
Douglas Aircraft Company*

shows the change in absolute ceiling is lost due to a one percent variation in any one of the four factors which determine A. For example, an airplane having an absolute ceiling of 50,000 ft., as indicated above Fig. 2, would suffer a 330 ft. decrease in ceiling if it were subjected to a one percent increase in weight, while it would gain 330 ft. if the thrust horsepower available were increased one per cent. These variations hold rather closely for small changes of the four factors, power, speed, weight, and parasite drag. It is evident from the figure that the most important factors are the weight, span, and power, while parasite drag is of much less importance. The weight and span determine the induced drag of the airplane under given flying conditions.

The above conclusions are in distinct contrast to the previous conclusions regarding the relative importance of the factors governing the maximum speed and range of airplanes. In the latter two cases the parasite drag was the more important factor. It becomes quite obvious from these conclusions that an airplane designed for maximum ceiling must be quite different from one designed for maximum speed or range.

The problem of designing an airplane which is to break the world's altitude record is clearly one of obtaining the greatest speed ratio for the most and the greatest thrust horsepower without allowing the weight to decrease too greatly. The engineer should be kept constantly alert as to the maximum lift weight should govern the maximum in which the altitude is reached.

Referring to Fig. 2, estimated values of A are given for the two most recent altitude record holders, the British Bristol 136 and the French

(Time to page 21)



Above center: The British Bristol 136 present record holder. Below: The Poteb 18 (French) which set the previous record.



Left: The Glas L. Martin Company, Baltimore, Md.; Below: Consolidated Aircraft Corporation, Dayton, Ohio



Boeing Aircraft Company, Seattle, Wash.

An Expanding Industry

Free from the forced-draft conditions under which factories in many countries are working today, our aircraft industry is going through a period of healthy growth. These pictures show recent, or projected additions to many of our plants.

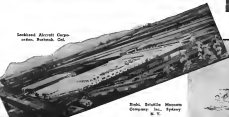


Left: Hamilton Standard Propellers Division, East Aircraft, Hartford, Conn.



Left: Grumman Aircraft Engineering Corporation, Bethpage, L. I., N. Y.; Above: Buco Manufacturing Company, Los Angeles, Cal. Right: Bente Aviation Corporation, Seattle, Wash.

Seaboard Aircraft Corporation, Butte, Cal.



Bohl, Briddle Motors Company, Inc., Sydney, N. S. W.



Boeing Aircraft Company, Inc., Seattle, Wash., Cal.





Two in One

Waterman's W-5 Arrowbile offers a practical combination road car and airplane.

THE new Arrowbile was first shown publicly for the first time at the National Public Aircraft Show on March 13 at Los Angeles, the Waterman Arrowbile marks an important milestone in the development of private flying. These factors may well rate the Arrowbile as the pioneer of a type of aircraft to revolutionize the use of small planes by the general public. In this unique hybrid auto-plane, incorporating a host of novel features, has proved thoroughly practical as a so-called road car and as a sport plane—without the change from one

to the other being effected in three minutes or less.

The Arrowbile was designed and built by Wally Waterman, power West Coast pilot (1909), founder of the Early Birds. He has had extensive experience as a transport pilot and plane builder and has attempted to incorporate in the Arrowbile practical features based on his long experience and his idea of what the private plane should be. Back of the Arrowbile is the famous "Whitely" tubular plane of 1932 and the Arrow-plane delivered to the Department of Commerce in 1936.

Other individual aircraft have been Indian, roadable and have had gaily detachable wings, two controls, automobile engines, and triple landing gear, but this is the first to incorporate all of these features in one practical vehicle. But, with all its novelty features the chief bid for fame of the Arrowbile rest not on its dual nature, on its equal on-landness on the ground or in the air, or its practical ability to operate from home

to airport and back again without involving anything in the way of performance in an engine.

As a road car the Arrowbile would command attention even without provision for wings. Streamlined and with rear fenders mounting, it follows latest automotive design trends. Licensed as a motorcycle in its classification as a three-wheel vehicle, the machine provides comfortable accommodation for two people, room over the high-way smoothly at speeds up to 70 m.p.h., has a service gear, brakes,



Studebaker drives around the country and will add the Arrowbile to their line.



horn, lights, rear view mirror, standard automobile engine, and no forward runabouts to its airplane except for the stationary propeller at the rear.

In a hangar equipped to mount the wings, the Arrowbile can be converted in an Arrowplane in three minutes or less. Wings lock on with footproof attaching devices and as there is no tail the operation is quick and simple. An air cylinder has disconnected quick takeoff, slow and short landings, and a top speed of over 115 m.p.h. Cruising speed is reported as 100-120 m.p.h., which is sufficient to meet the needs of the average private flyer. Range is 400 miles.

Even though it had no automobile characteristics the Arrowbile would be outstanding in a small plane for its safety features. Control has been simplified through linkage of ailerons and wing tip rudders so that the pilot turns the plane automatically with the wheel, and pushes or pulls the wheel control to descend or climb. With novel control arrangement it is said to be impossible to spin the plane and difficult to get it into a stall, as the plane naturally tends to recover even before the stall condition is reached. In taking off or landing the well recognized advantages of the "V"-cycle



Left—Wings are detachable and are stored at the airport. Below—The public sees the Arrowbile.



landing gear are an added safety feature eliminating fear of ground loop or nose over. The plane may be flown in, or skidded in to be ground in the long travel landing gear has been designed and built to take the shocks of skidded landings by nose or tailwheel pilots.

With ATC now pending on the Arrowbile it is reported that the converted 100 hp. Studebaker six cylinder automobile engine with which it is powered has successfully passed the required 100 hr. of test running. Ten months are now under production and when it is noted that, with all its unique features, the Arrowbile still retails at less than \$5,000, including night flying equipment, starter and generator, it can be speculated that the influence of this novel plane is likely to be widely felt in the private plane market. Because of its strongly engineering background an attempt to sell and service the Arrowbile through established automobile agencies is now being considered. Airports would be licensed to operate wing storage and attaching equipment, and the possibility has been suggested that the Arrowbile will be sold to customers as a car, the wings being rented as needed from any commercial airport. Thus the Arrowbile from the pro-



ditions here are going to the Studiotek Corporation, which plans a nation-wide sales and demonstration tour in the interest of auto sales by their national dealer organization.

In service the Arrowhead may be stored as a two place side by side cabin monoplane of high wing, steel cantilever, strut braced type, tailless. Construction is principally of metal, the structure being of welded steel tubing structure covered with dural sheet, while the wings are of two spar construction with spars of rubber spring, formed dural sheet, and steel tube drag bracing, cloth covered. Of particular interest is the engine installation and mounting of accessories. The Studebaker engine is standard except for

one of a stack high compressions head spruce, spruce and cedar radiata. The design also covers exhaustors and a large oil sprayer. The engine mounted in such a way that most of the weight is along directly to the two main landing wheel struts, removing landing loads from the fuselage framework proper. Drive to the ground power shaft is by means of multiple groove pulleys and, via two belts, the pulleys being spaced on about 38 in centers. Engagement is made by raising the upper shaft against the belt. Drive to the wheels is through special chain belts for forward speed or by direct friction for reverse although a gear box may later be substituted for this purpose because of the design. The main

[illegible]

A MILLION TIMES A SECOND



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From the new product to the finished apparel. On the left are various finishes of raw cotton as mined in Brazil. Right are shows attached to fabric sections and the pattern on blouse. On the right you see each one alone in finished grey and crystal and some of the blouse.

Optional accessories and equipment is available. Other features are available in the model range.

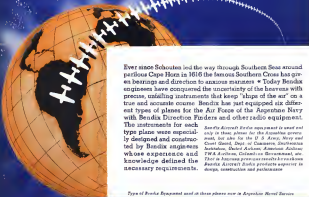
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BENDIX

RADIO CORPORATION

SUPPLANTING THE SOUTHERN CROSS



Ever since Schouten led the way through Southern Seas around perilous Cape Horn in 1616 the famous Southern Cross has given bearings and direction to anxious mariners. • Today Bendix engineers have conquered the uncertainty of the heavens with precise, unfailing instruments that keep "ships of the air" on a true and accurate course. Bendix has just equipped six different types of planes for the Air Force of the Argentine Navy with Bendix Direction Finders and other radio equipment. The instruments for each type plane were especially designed and constructed by Bendix engineers whose experience and knowledge defined the necessary requirements.

Bendix Aircraft Radio equipment is used not only in these planes for the Argentine government, but also for the U. S. Army, Navy and Coast Guard, Dept. of Commerce, Smithsonian Institution, United Airlines, American Airlines, TWA Airlines, Colonial Government, etc. There is a long list of previous results in various Bendix Aircraft Radio products superior in design, construction and performance.

Type of Radio Equipment used in these planes now in Argentine Naval Service

CONSOLIDATED
Transmitter, Receiver, Direction Finder,
Interphone



POWELL COCKER
Transmitter, Receiver



CRUMHORN
Transmitter, Receiver, Direction Finder



MARTIN
Transmitter, Receiver, Direction Finder,
Interphone



Direct Air Correspondence to
Bendix Radio Corporation, 9th and Kenney Streets, N. E., Washington, D. C.

BENDIX

RADIO CORPORATION

NEW YORK, WASHINGTON, DAYTON, CHICAGO, OAKLAND

DC-4 Details

Douglas releases first information on long-planned 4-engine project



AFTER YEARS of planning and detailed engineering work, and months of speculation as to the features to be incorporated, preliminary details of the new Douglas DC-4 four-engine, four-engine transport have been announced by Donald W. Douglas. Particular emphasis has been placed on the project's engineering background against which the plane has been developed. With experienced engineers of TWA, United Airlines, American Airlines, Inc., Pan American Airways, and Eastern Airlines co-operating with the engineering staff of the Douglas Company, the development of this plane has brought together a greater concentration of qualified engineering brains than has ever before been concentrated on a single aviation problem in the history of the industry.

In general proportions the DC-4 closely resembles the DC-3 and DC-3 models. Fuselage and wing although

larger, are similar, — the body retaining the typical Douglas characteristics, and the wing incorporating the so-called leading edge sweepback and straight trailing edge. There, however, resemblances cease. Aside from the obvious four engines in place of two, the three points that arouse primary interest are (1) theicycle landing gear, (2) the three rubber tail, and (3) the so-called (3) deg.) of the horizontal stabilizer. The tricycle gear, made down as recognized safety feature, will provide level landings as an added comfort feature—especially important at night when landings and takeoffs may be made without evading choppy passengers. The unique tail design has presumably shown improved stability characteristics in wind tunnel testing, although an official comment on this point is yet obtainable.

General details of construction of the DC-4 are quite similar to those of the all-metal stressed skin DC-3 and DC-3 transports. Landing gear is fully retractable for all three wheels.

Landing gear use 25 deg. and outward swing 5 deg. Flaps are of generous size and conventional design except that the wing flaps each extend partially across beneath the fuselage to eliminate the third panel interference well. A fully-curve conventional beneath the fuselage cabin is provided, speeding landing of cargo, simplifying balance of load.

Cabin accommodations in the DC-4 broadly reach a new "high," with a floor-to-ceiling distance of 39 1/2 in., as significantly 74 1/2. Inside width is 126 in., or more than 10 ft. As a day plane seating accommodation is provided for 40 people and as a sleeper for 20, the cabin making (Time to page 12)



Curtiss Controllable

An Electric Constant Speed Full Feathering Propeller



THREE IN SEVEN aircraft designers, naval-airplane types specialized for high altitude operation have adopted the Curtiss electrically operated propeller system. To remove the load operating conditions with a maximum of stresses from the pilot, constant speed control is essential. To meet the requirements of increased speed range, a wide operating range of blade angles is necessary. To prevent possible further damage to the engine and airplane due to "stall-back" at the time of take-off or one of the power plants, and to secure a maximum of performance from the remaining power in high altitude, the propeller has a wide range of adjusting blade angles of 33 to 80 degrees at full "forward."

The Curtiss Electric Constant Speed Full Feathering Propeller has been developed to meet all these requirements. The electrical method of control has a flexibility which permits of either constant speed, or selective manual control in the same installation. Under selective manual control, any blade angle between the low pitch least setting and the "forward" angle may be obtained and maintained or dependent of engine condition, at the will of the pilot. At any operating condition, propeller pitch may be fixed for maximum climbing, maximum speed and performance climbing. The full construction and blade revision need impose no limitation on blade angle movement to greater than 130°,

which is sufficient to cover all conceivable requirements on land, water or in the air. The completely enclosed pitch actuating mechanism is protected from all weather conditions such as extreme temperatures, salt-lanes and long conditions by being completely enclosed in an aluminum housing.

The Curtiss Controllable Propeller Hub mechanism is readily adaptable to the use of either hollow steel or

standard detachable type aluminum alloy blades.

The hub proper is of the cast place type, machined from a high strength alloy steel forging. On its rear extension is mounted the slip ring assembly which transmits electrical energy from the stationary brushes to fixed contacts at the front face of the



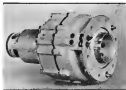
How the Curtiss Electric Controllable works. The 12-volt electric motor on the hub rotates the blades through a 3-phase electric constant gear with a drive ratio of 34:100 to 1.



AVIATION
May 1937



Details of blade and clamping gear mechanism.



Blade and gear assembly. Blade to extreme right.

hub. Suitable crash-halt nut, adapter bolt locking means are provided for ready maintenance on the attached gear prior shaft.

Two brass rods, accurately machined of a pair of spring loaded rollers, one position bracket for each slip ring, mounted in a block of insulating material and supported by a light alloy bearing bracket to the front cover of the engine case. This bearing completely houses the electrical parts and serves to seal and protect the parts from the effects of moisture, dust and other foreign matter. To insulate against shock and vibration the brass block is supported on its bearing on special rubber bushings. Leading into the bearing is a standard conduit fitting.

The longitudinal end of the blade is carried from a shoulder at the base

end, through a stack of angular contact bearings to the blade end, where special hardened thrust washer is in the hub barrel. The one bearing at the base end is provided for taking the "push" when the blade end is displaced to eliminate play from the bearing stack.

When hollow steel blades are used, the bearings are mounted directly on the accurately turned, stack of the blade. For standard stock aluminum alloy blades, a split steel sleeve with standard clamp is provided for mounting the bearings.

Power change is effected by means of a power unit, as shown on p. 36.

The main construction of the power unit, electric motor, speed reducer, slip ring and brush assembly greatly facilitates the interchange of parts between

propellers and the replacement of parts with a minimum loss in operating time.

The normal pitch range of the blades is controlled by electrical cut-out switches operated by a cam on the shaft with the power lever gear. This range is usually made to cover the full requirements of normal flight, from take-off to maximum gliding descent speed. The number of cuts on the power gear drive shaft differs as dictated by a simple process of selecting the range of the limit switches may be readily divided to properly accommodate the take-off ratings of various engines. Blade angles outside the normal flight range such as feathering are obtained at the will of the pilot by means of the manual control device which he places the cut-out limit switch.

(Continued on page 70)



Full governor control unit to be mounted in cockpit; slight the governor maintains engine speed within 3-4 r.p.m.



AVIATION
May 1937



PENNSYLVANIA - CENTRAL AIRLINES



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WHEN a PCA airliner taxis down the runway at the airport, swings into the wind and takes off . . . her engines are lubricated with Texaco Airplane Oil.

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TEXACO *Aviation Products*

Lycoming Announces Refinements—

Advanced series B500D engines bring transport engine features to medium horsepower class

Lycensing has just announced a new series in which are incorporated a host of detail refinements, although all basic features of the R 680 model are retained. Features of the new engine are based on the aggregate experience of more than one hundred million miles of flight in the hands of every type of operator. Certain features have reported many Licensing engines with more than 3,000 hours flying service and still in use.

Many notable refinements of the ID series is the greatly increased cooling air area, providing approximately 20 sq. ft. of air for each cubic inch of engine displacement, or a total of more than 70 sq. ft. of cooling air area for a 700 hp engine. The increased air area, together with closer fitting cylinder air baffles and more exhaust ports, lowers series ID operating temperatures and achieves better uniform cooling. Additional cooling is obtained in the medium compression stages by providing reduced pressure for them as well as for the high compression models.

Other enhancements include the use of two valve springs on all valves, resulting in higher spring pressures and improved valvetrain; an improved 13 spline timing chain; a new drive shaft driven by a removable housing in the rear of the crankshaft; and placing of the new spark plugs closer to the top of cylinder heads, promoting cooling and combustion.

A new piston ring type together with an in-line gas-pressure sensing positive oil strainer under its operating conditions. As all previous oil valves invariably drain valve ports at oil loss covering the engine from the oil tank when the engine is not in operation. The engine oil pump is operated at reduced speed, and an oil seal at each discharge flange prevents loss from rear crankcase of engine. Completely automatic valve port lubrication is standard with push-on hose to spray complete drainage of each rocker box during idling periods on the ground and when the engine is stopped. New reinforced torque boxes and new inner rollers sealed with rubber

makes the automatic lubrication feature completely optional. By complete elimination of manual lubrication, operators of the new D series Lycoming may fly from dawn to sundown without maintenance attention to the engine.

All accessories are now so grouped as to provide the most complete accessibility; standard equipment included are: one dual type magnetic tape; *Stamula* distributor, starter, generator, fuel pump, vacuum pump, and magnetron drivers. Other equipment furnished with each engine includes Stromberg-Edwards N-RTA carburetor, Inertia Cone oil filter, pressure type oiler, fuel filter, booster oil connection to left distributor, individual valve shutoff, fuel pressure adjustment to fuel three cylinders, and propeller. The engine is the AN-3B type, 200-hp, 1800 rpm, 1000 in. dia. The AN-3B features the advantages of either fixed or convertible propellers of licensing mechanically operated type or Hamilton-Standard hydrofoil. Provisions for controls of either type are made suitable with

the forest truckcase section. Special
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[illegible]

Electric Control—

is combined with throttle control handle in order to simplify pilot's selection of compressor blade speed.

TO DESIGNER FOR CONSTRUCTION of control system has developed a pitch control for propellers that is incorporated in the throttle handle and adjusts the pitch, with one hand, to set the engine speed for a given desired condition of take-off, climb, or landing, and simultaneously set the propeller blade angle. Fore and aft movement of the throttle handle operates the engine control as before, and turning the throttle handle leads clockwise or anti clockwise operates an electric control which increases or decreases the propeller blade angle.

The electric universal tool used is installed on the adapter on the front of the engine. A switch housing is mounted in connection with the thrust handle. When the throttle is turned to close one of the two levers, the selected switch is stationary. The lever is connected with the gear with the gear worn in the rotating propeller, thus changing the blade angle. Rotation of the thrust handle also when the desired blade angle has been reached denotes the stationary; when it is moved, out of engagement with the gears is for rotating properly. Thus, as long as the thrust handle is held in a clockwise or anticlockwise position a definite increase in the blade angle is observed. The change in the blade angle is proportional to the rotation of the thrust handle. The thrust handle is self-actuating, operation is convenient.



Since this Famous Flight 10 YEARS AGO

In the brief span of ten years since Colonel Charles A. Lindbergh made the historic non-stop, solo flight from New York to Paris, in his Wright Whirlwind-powered "Spirit of St. Louis," air transportation has had a very phenomenal growth.

Passenger traffic in the United States alone has increased from a few thousand airline passengers in 1927 to over a million in 1936. Nine million flown over America's leading air routes have increased from a few hundred thousand miles in 1927 to over 64,000,000 miles in 1936—415% of the world's total commercial transport flying.

Wright aircraft engines have played a vital part in the tremendous growth of air transportation throughout the world. Today Wright Cyclone and Whirlwind engines not only power the majority of the leading airlines of the United States, but the fastest mail equipment operated by leading airlines throughout the world.

Famous Cyclone-powered Lindbergh Flight

1931—Culver and Mrs. Charles A. Lindbergh's flight from Washington, D. C. to Tokyo, Japan in a Cyclone-powered Lockheed Vega Monomane, equipped with floats.

[1931—Colonel] and Mrs. Charles A. Lindbergh's survey flight for Pan American Airways, in their Cyclone-powered Lockheed Stinson, to Europe, Africa, South America and return. On this flight the Lindberghs visited 31 countries and colonies—spanned both the North and South Atlantic Oceans—covered a total of 36,000 miles!

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TWO-WAY AVIATION RADIO TELEPHONE AND TELEGRAPH EQUIPMENT

Monocoque for 1937— Improved performance for latest version of model 90-A

THE MONOCOQUE BY WEST HAVE BEEN MANUFACTURED TO STAY IN THE MARKET FOR THE MONOCOQUE. Detailed performance has further established the model 90-A for 1937 as one of the leading utility airplanes of the country. Featuring all of the well known advanced features of the high wing two plane side-by-side strut braced monocoque, the newer Monocoque, with Lambert H-360 engine and flap show a top speed of 120 m.p.h., cruising speed of 115 m.p.h. and landing speed of 40 m.p.h. New windshield and steel improves vision from the cabin, the main are larger, side to side, modern are deeper, and the door is lighter. Standard equipment of the Deluxe model includes wheel pants, S.A.C.A. landing, wing flaps, jacking ladder, main gasoline, clutch, compass, altimeter, airspeed indicator, tachometer, oil temperature and pressure indicators, 400 ft. D. rem-bellows tires, dual controls, for compass, tail wheel, navigation lights, first aid kit, tools and log book.

Beechcraft Cruises at 235—

Powered with Wasp Jr. SC-G engine, model D-17 cruise transp.

SPREADING OF WING AREA AND CRUISE SPEED ARE THE PERFORMANCE OF ANY transport plane now in service, the new Beechcraft Model D-17 powered with the Pratt & Whitney Wasp Jr. SC-G engine would stagger the in-



Monocoque in flight

agination were it not for the known performance of its performance. With a cruising speed of 235 m.p.h. at 13,500 ft. using 365 hp and a landing speed with flaps of 30 m.p.h., the plane shows a remarkable speed 1150. Among important new refinements on the D-17 are a new wing section, stabilizer tail group, and new laminated flap attached to the lower wings. Improved shock absorbers are designed to take great landing loads and provide smoother landing. The constant speed propeller makes maximum cruising performance possible and the cabin has been enlarged and rearranged to provide exceptional room for four passengers and pilot. The fuselage has also been lengthened and the tail wheel set back to provide another ground operation over rough roads. Specifications as outlined by the Beech Aircraft Corp., Wichita, are: Span—32 ft.; Length—36 ft.; 1532 lb.; Height—8 ft.; Wing area

—267.5 sq. ft.; Power loading—15.7 hp/sq. ft.; Empty weight—2335 lb.; Gross weight—4200 lb.; Fuel capacity—120 gal.; Oil Capacity—75 gal.; Performance: Cruising speed—235 m.p.h.; Landing speed—30 m.p.h. (with flaps); Service ceiling—20,000 ft.; Rate of climb—2500 ft./min.; Cruising range—variable. Standard engine and flight instruments: Cessna Exhaust Gas Analyzer, Cylinder head temperature indicator, manifold pressure indicator, oil pressure gauge, oil temperature gauge, tachometer, ammeter, compass, altimeter, air speed indicator, bank and turn indicator, rate of climb indicator, Manoeuvre instrument lights Standard equipment: Electric starter, generator, storage battery, engine driven fuel pump, head warning pump, flap-over control cables, cabin heater, fusible circuit, two cabin ventilators, electrically operated wing doors, electrically retractable landing gear, constant speed propeller, P & W Wasp SC-G Jr. engine



The D-17 Beechcraft (Wasp Jr.)

With Foreign Builders

Interesting Information on New
Planes From Abroad

FOREIGN AIRCRAFT BUILDERS from all quarters of the globe continue to demonstrate the ingenuity and ingenuity which so often characterize their work.

Among the more unusual new developments is the Delta Jone J-6 built by Alberto Jone, of Milan, Italy. The Jone J-6 airplane is a single



The variable-thrust Jato J-34

engine controller using computer of normal construction and appearance. Such wings are of wood construction with wood covering, while the fuselage is of welded steel tubing, which covered. Fitted with a Fiat A-64 seven-cylinder engine developing 140 hp at 2300 rpm, the Jato has a top speed of sea level of approximately 325 m.p.h. It is in the control system that the Jato differs from the ordinary, in the entire upper wing is hinged laterally so that it is movable independently or by the pilot, while the relative movement in the fuselage remains the same. It is so that the machine is flown by the stick alone, and that the rubber is unnecessary except for ground maneuvers, and is normally locked in flight. Normal use of the ailerons on the part of the pilot serves to tilt the wing, as it will tilt immediately when the wing changes from its normal lateral position while in flight. The upper wing is tilted with Handley Page slots and ailerons, and the lower wing with flaps. It is desired that with the upper wing free to work independently the Jato will not spin or stall, and

the automatic lateral control simplifies piloting in bad atmospheric conditions. A simple hydraulic gear is used in locking the top wing for normal flight or aerobatics.

German aircraft builders have recently contributed two advanced types, one civil and the other military. The Junkers Ju 56 equipped with two Junkers Jumo engines was described in Aviation for August 1936. Since that time a number of these machines have been placed in regular airline service, the first example of Daimler powered new production planes being adopted and a further example of Daimler patents, gifts and of German leadership in this field. Unusual proof of the reliability of such Daimler engines, and of its efficiency for operation over long ranges was given by the recent flight of a Jumo powered Junkers from Buenos Aires to Rotterdam and return, one stop en route. The second flight, a distance of 3,625 miles, was flown in exactly 26 hr., at an average speed of 181 mph, and a fuel consumption by both engines of 92.7 gallons per hour. The Ju 56 "Eisenherz" with Junkers

two Jumo 250 heavy-oil engines provides ready accommodation for ten passengers and baggage in addition to the two pilots. It is reported that several of these planes are shortly to be placed in the Germany-South America mail service, flying the South Atlantic crossing.

An interesting military development is the new Puck-Wulf two engine observation and bombardment training plane, which is capable of light military duty but was designed primarily for the training of pilots for larger and faster planes. Designated as Puck-Wulf Pw 38 B "Weber" the plane is of low wing design with a semi-canister wing and retractable landing gear. Construction is of welded steel with wood wing and steel tube fuselage, cloth covered. Power is supplied by two Argus (reverted) VII engines Model A-16 C developing 240 hp, each, mounted to the engine used in the Puck-Wulf flown by Gen. Goerdel at Los Angeles during the 1936 National Air Races.

Wings of the Puck-Wulf "Weber" are sharply tapered and are based to the fuselage by a single strut beam each engine mount to an inverted trapezoidal structure in rear of the main cockpit. The forward mounting of the horizontal stabilizer characteristic of many recent German planes is a distinguishing feature of the "Weber". A crew of four is normally carried, consisting of pilot, co-pilot and radio operator, machine gunner in the rear turret, and machine gunner and bombardier in the forward turret. Complete equipment for blind flying and low key radio communication is carried, making possible extensive flight and tactical problems for simultaneous training of the entire crew. Performance figures are not available.

A CORRECTION

THROUGH THE EDITORIAL ERROR a line was dropped in the Specifications Table on Page 70 of Aviation for April. Below is the corrected order for Specifications No. 100-134, only one. By cutting out this step and putting it once the original Specifications No. 120-122 the attention will be made. The order of appearance in the original Page 71 is correct as it reads.



Puck-Wulf Pw 38 B "Weber"

120 Standard Armament
121 Standard Armament
122 Standard Armament

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Operators' Corner

An exchange of ideas on the problems of the commercial aviation industry

QUESTION #1: Do you believe that a cockpit should be located for control of the aircraft? Or is it better to have the pilot in the rear? Do you believe that the pilot should be seated in the rear of the aircraft? Do you believe that the pilot should be seated in the rear of the aircraft? Do you believe that the pilot should be seated in the rear of the aircraft?

Need instruction riding

Since private pilots are capable to carry and some transport pilots aren't will be. At present there are a good many private pilots bookkeeping instruction and being paid for it accordingly. There are also a good many transport pilots who have gotten their licenses by other means such as being paid by banks and earned money to maintain a good living.

The only effective solution for this problem is an instructor's rating—a special classification of license given by the Air Commerce Bureau and based on the ability of a pilot to impart knowledge to students. Such a rating could be conferred on either private or transport pilots with the stipulation that private pilots with an instructor's rating not be permitted to charge for their instruction.

Such a regulation could be adequately enforced only by private control with operation throughout the country. Because of the ratings should be done progressively after personal examination of each instructor. All pilot-instructors now operating should be permitted to continue until the time of their examination and thereafter at the discretion of the examiner. In addition to the field personnel, a small staff at Bureau headquarters could be maintained to collect and distribute background material and other information to assist pilots in qualifying for their ratings.

In the course of this system would want the individuals and eliminate much of the troublesome competition that has harassed responsible operators and, in many cases, made flying instruction hazardous to students—A. G. Stewart, Instructor in Aviation, Tussock High School, Tussock, N. J.

QUESTION #2: Should a private pilot be allowed to carry mail without evidence in the form of a security license? Is it better to have a private pilot who is not a security license? What is your attitude? Do you think it is better to have a private pilot who is not a security license? What is your attitude? Do you think it is better to have a private pilot who is not a security license?

Leave Private Pilot Alone

THE BACKGROUNDS OF THIS AVIATION INDUSTRY is the licensed private pilot. It would seem a disservice if his privileges are in any way curtailed. He may not be able to instruct as well as some transport pilots but on the other hand he is the owner of getting other people in to the air and transport and ready to pay expenses. Some people cannot pay for transport instruction and others do not want to pay for it. For instance the private-day laborer or brother will naturally want to have his son or his brother or best friend, etc. Let them alone and let them ride and we will have nothing but a few better private and authorized air lines forever—G. Mann, Jr., former Deputy Director of the Montgomery School of Aeronautics, Montgomery, Ala.

Ability the Circumstance

AS WE HAVE UNDERSTOOD THE AIR Commerce Bureau regarding private pilot instruction, we believe that private pilots can instruct when they can get their airplane and devote their time and services to whatever they are instructing. If a private pilot wants to instruct and wishes to give instruction to a friend who is not a pilot, hold a student permit we believe that this does not violate the regulations. Our experience has been that there are certain individuals who have ability as instructors and who have successfully taught several of their friends to fly—A. G. Stewart, Instructor in Aviation, Tussock High School, Tussock, N. J.

Helps Build Up Time

A PRIVATE PILOT may certainly should be permitted to carry and instruct students in licensed aircraft provided he does so without remuneration. Such a process makes it possible for him to give experience and at the same time to help his friends or relatives build up time. It also helps him to crystallize his own instruction by putting on the things he has learned to others—Thomas Turner, Operations Manager, The American Executive, Fleet Research Field, New York, N. Y.

QUESTION #3: Do you believe that a private pilot should be allowed to carry mail without evidence in the form of a security license? Is it better to have a private pilot who is not a security license? What is your attitude? Do you think it is better to have a private pilot who is not a security license?

Even the Grandparents

IF WE ARE APPROACHING A NEW THING for the first time on airplane sales work we must each member with equal consideration even to the most, most and grandmothers.

If a man approaches at himself to work on him and let him decide as to whether or not to bring his family into the airport. If he does, we then work on that as well. We let the man guide us by his actions as to whether or not he is dependent on his family—L. G. Mann, Jr., former Deputy Director of the Montgomery School of Aeronautics, Montgomery, Ala.

Next Month's Question

QUESTION #4: What action does the industry take on the problem of the private pilot who is not a security license? Is it better to have a private pilot who is not a security license? What is your attitude? Do you think it is better to have a private pilot who is not a security license?

News of the Month

Highlighting recent events in the aviation world

World Air Service Progresses

FAA completes New Zealand survey flight progress for China service. Start of Atlantic flying approaches

A **COMBINED** survey of 7,800 miles of Pacific China was accomplished by Pan American Airways late in March and early in April. The Pan American Clipper, a specially modified Boeing 34-42R, under command of Edwin C. Mander, made the circuit trip from San Francisco to Honolulu to Klugeville Reef to Papa Paga to Auckland and back. Every minute of weather was found over the course, giving the crew full opportunity to experiment with headwinds and use of the radio direction finder. Of these there were two types: the larger one at the ground station, and a smaller edition carried aboard the Clipper.

Because the flight was primarily a survey project, to observe and chart

clouds and weather conditions, the trip was considerably slower than will be the scheduled service. At that, scheduled flying time, Honolulu to Auckland, was only 40 hrs. 22 min., including 10 hrs. 20 min. Captain Mander said on returning to Honolulu that the route was actually feasible for a four or five day service from San Francisco to New Zealand.

The Pan American Clipper, renowned Hapling Clipper, was scheduled to go into service between Manila and Mexico and Hong Kong April 25, closing the last gap in the trans-Pacific service. That first flight was to be with only one, and a week later, April 28, was the date set for the first through transport of passengers

to the Orient. That will make possible a complete routing of the globe by commercial airlines.

The Atlantic service remains complicated and indefinite, with no date set as yet for even experimental flights. Rough projections are French, American, and German firms indicate early start of survey experiments.

Early in April, news from Portugal told of the granting of landing rights in the Azores to Pan American. That includes radio, weather, customs, health, and immigration services. It is a result of three years of negotiations between Pan Am and the Portuguese government, and provides a 20 year franchise. It is understood that similar rights will be granted Britain's Imperial Airways.

The German company, Deutsche Luftfahrt, while it has applied for rights in the Azores, is also taking steps in another direction. With a view to confirming the establishment of experiments of last November, a new mother ship, *Preussag*, was launched in March at Kiel. She will be stationed at Horn, in the Azores, where flying boats will be landed. The *Preussag*, and it has been reported, will be the first German's trade on the Azores-New York-Newfoundland triangle, will be stationed some 2,500 miles north New York.

British plans center around the Empire Flying Boats, two of which, *Caledonia* and *Camden*, have been accepted in long range flight tests. They are coming from New Zealand, where the British are constructing a large land and sea airport at Bluff's Camp, deep at the wilderness. There a reconnaissance field is being carved out of the forest. It will have three 4,500 ft. runways, each 400 ft. wide, and a water runway, parallel to the prevailing wind direction, a mile long and 1,200 ft. wide. On Camden's Lake, less than two miles away, a water airport is being laid out.

Rapid diplomatic changes over location of terminals and other matters affecting joint operation by Pan American and Imperial Airways were

delayed away early in April. Though British and Canadian representatives had met for Montreal as the terminal as part of the British scheme of "all-empire" service. Col. J. Blane Johnston, Assistant Secretary of Commerce, insisted that it is more to be a joint service, the Western terminal should be New York.

Meanwhile, another element appeared in the picture: The Glen L. Harris Company, builder of the three Martin 140 Clippers now flying the Pacific for Pan American, announced plans for a new flying boat with a passenger capacity for 40, range of 3,000 mi., speed of 175 mph or 155 per cent power, payload close to that maximum of 7,200 lbs. They would be used on an 181 to 211 ft. North Atlantic Service, operated by a company now being organized to compete with Pan American.

Details of the six 40-48 ton, 77 passenger flying boats being built for Pan American by Boeing at Seattle were announced April 29. They will have three decks: the top to house the flight bridge, crew living quarters, and a large cargo compartment. The middle deck will carry the passengers during and during return, and carry the lower deck as it be the main cargo hold.

Most significant announcement concerning these boats is the fact that they will be powered with four engines newly designed by Wright Cyclone division, twin-row Cyclones developing 1,500 hp—most powerful radial six-cylinder engines yet developed. Twenty-six of them will go to Pan American for use in the new "super-Clippers."

Time Flies Fast—Havens demonstrates new ship, breaks Miami-Newark mark

FIRST PUBLIC REMINISCENCES of Frank Havens' Time & Victory Flying Wing-powered monoplane, Time Flies, was made at New York's North Beach Airport April 3, when Havens set it down on the runway after a 200-mile-a-hour, 46 minute flight from Washington, where he had taken it to demonstrate the engine installation to interested Army and Navy officials. Use of the engine, rated at 1,150 hp (but taken), was questioned by both services, as it is on the restricted list of such.

The present record-hate attitude on engine speed-upto speed records—April 12 (perhaps possible, as Time Flies' engine number is N81313)



"If at first you don't succeed . . . And Andie Eichen is going to do just that, for she will keep going until she gets it right or until she is shot down." She will push all limits on her projected "round-the-world" flight to see if her Eichen is right. A week to finish would not be the first attempt.

made good his promise by flying from Miami to Newark, 1,296 miles, in 4 hrs. 21½ min. Howard Hughes holds a 4 hr. 21½ min. record from Miami to Floyd Bennett Field.

But that was Time Flies' last flight, as the right wing spar broke during the rough landing. The ship was to not sprout and with its plan unburned, but its right wing being badly hurt. Havens indicated that he would not rebuild it. "I've had my day."

Safety Wins—Eastern, Northwest PCA banned for their operating records

SAFETY IN AIR TRANSPORT was immediately recognized April 14 by the National Safety Council at the establishment of the Greater New York Safety Council. For outstanding contribution to safe air travel, three airlines—Eastern, Northwest, and Pennsylvania—Control—were named for their operating records in Group A—domestic airlines operating more than 20,000,000 passenger miles annually. EAL was named, with a record of 16,794,000 passenger miles without any passenger fatalities. This covered the years from 1930 to 1936. Group B winner—airlines operating less than 20,000,000 passenger miles annually—was Northwest, which never had a passenger fatality in its entire operating history, 1932-1936. The line flew 48,738,413 passenger miles.

A special award was made Pennair.



GRIPPER GLIDES TIME

between the United States and "over water." This Boeing 34-42R, which April 22 was scheduled to go into regular service between Honolulu and Hong Kong, planned a new 7,800 mile trans-Pacific route to New Zealand.

MARTIN D.S. WILLIAMS also "General Weg-Tee," *Sgt.*, *British Army*, *The Buffs*, *Poona*, *Bombay*, *India*.

—Call Hardware, Redwood City, California

It was a scene of pleasure as they three
 you compared our Gulf Products in their
 place — Benzoline, General, and Gulf
 Aviation Gas and kerosene, and Gulf Air
 and Gas and Gulf Arctic Oil.

 **PRODUCTS**

David. Marjorie. Set up on a street.

Mass. Life Guard Co. by the Argentine government. The order, which grants the company's inflated order totaling to \$12,500,000 will be lifted this year.

Ryan to Ryan—Sam Reader, Ryan sales manager, who recently returned from the East, reported that the Ryan plant received unusual attention at the New York Show. Twenty-one sales were made by Reader on his trip throughout the Eastern territory.

Taylor Continued—Within a week after he landed on planet at Houston, Pa., the Taylor Aircraft Co. delivered a new Taylor 1000 to the president of the Brookfield Chamber of Commerce and local manufacturing concerns.

 PRODUCTS

Aug. 1877



Famous in Commerce... NOW CHOSEN BY ARMY AND NAVY!

Soon two fleets of new S-43's will soar away from the Sikorsky plant to enter the service of the U. S. Army and Navy. The selection of these famous amphibians for transport, convey and general utility purposes is further evidence of Sikorsky's dependability in long range operations calling for speed and maximum useful load.



SIKORSKY AIRCRAFT

BRIDGEPORT, CONNECTICUT
DIVISION OF HYDRO AIRCRAFT CORPORATION

AVIATION
May 1937

Delays during the week following the fire were larger than in any single week since the company began manufacturing planes some years ago— which means that production had to be resumed promptly.

Bois American North American—North American Aviation, late in March, reported the sale of thirty two-engine military general purpose aircraft to Argentina for a price of approximately \$200,000. Bois North American and Northrop have announced that they are bidding on an additional Argentine order for approximately \$1,000,000.

Bois American—Walter Whitehead, president of the Wisconsin Aircraft Company, reports sale of seven of the new available Aeromarine, the first of which was launched at the recent National Pacific Aircraft Show. Whitehead credits the show with sale of five of the seven planes; three are being on order for Switzerland.

Bois American—Dodge-Way—Security Aircraft Corporation, Long Beach, Cal., completed construction of plans for aircraft production on April 15 and started construction at the first production lot of twenty-five of the new Security Aircraft, folding wing cabin monoplane making two.

Pan American DC-3's—Among recent orders announced by Douglas Aircraft Company are seven twenty-nine passenger model DC-3 planes for Pan American Airways at a price said to be in excess of \$1,000,000. It is understood that the planes are to be placed in service on the Brownsville-Crescent route, and along the west coast of South America.

Bois American—Bois American Corp., leading Pacific Coast aerospace service and supply house with headquarters at Berkeley, Cal., and branches in several Western cities, has been purchased by Bendix and will be known as Future as Bendix Aviation Corp., Ltd. Bendix Aircraft continues as head.

Bois American—Secret orders from foreign governments totaling more than \$1,500,000 for high speed light bombing planes have been booked by the Vickers Division of the Vickers Manufacturing Corporation, Downey, Cal., according to Don E. Smith, vice-president and general manager.

Aeromarine Announced—For some figures 244 planes for war games on Pacific coast.

Emergency of the Army's requirement is made a close approximation of wartime mobilization problems in America's greatest military manufacturing of aircraft is indicated by

the service with which the 1250 Air Force, under command of General Frank H. Andrews, has prepared for the construction of 244 planes in California early in May.

Planes will leave at March Field, Riverside, and operate for a period of thirty days a week in extensive military operations over the territory extending from Alhambra, New Mexico to the Pacific Ocean and from Fresno, Central California to the border of Lower California. Mexico. Civilian part of the business is set for May 5 which is designated as "M" day or mobilization day.

Business Booms—

Fixed base operations prosper again. New England groups organize.

Reports from over the industry are constantly increasing activity among the fixed-base operators in ship, club, charter business, lightening flights. Much of the new ship buying is the result of a recent growth in student membership.

Dale Hunter, Portfield distributor at Sacramento, Cal., has reported sale of one of the popular little ships to Dr. A. E. Lovett of Sacramento. This made necessary a busy trip to Kansas City to get another new plane, and at the same time Hunter arranged for delivery of one of the new Portfield Zeppelins.

Three airplane pilots were announced in Oklahoma City on March 27 by airport officials making a total of eleven pilots in Oklahoma City in the 90 days preceding that date. Harry Young announced the sale of a new, War standard cabin biplane to Harry Blackstock, Oklahoma City of one. The new plane will be flown by Porter Blackstock, his son.

The American Operators' Association of New England was formed late in March by several New England fixed base groups. The members of the association come from Massachusetts, and include Boston Airline, Boston Municipal Airport, Beverly Flying Service, (Highland) Devonport Airport Operating Co., Wollaston; East Coast Airways, West Haverhill; Framingham Air Service, Framingham; E. W. Wiggins Airways, Needham; and Providence (R.I.), later City Airlines, Boston Municipal Airport, Olden Flying Service, New Bedford; Woburn-Lynn Airport, Woburn; and Middlebury Airport, Middlebury. The purpose of the organization is twofold: first, to raise the standard of flying throughout New England by agreement on regulations.

Traffic

Latest available statistics from the Bureau of Air Commerce and the Post Office Department—Domestic airlines only.



AIR TRANSPORT INDICATOR

April 1, 1937

107

—which is the ratio of revenue passenger miles for March 1937 as compared with the corresponding figure for March 1936.

For February 1937 the ratio stood above at 128.6.

AVIATION
May 1937

and improvements at the many airports, small and large, that dot the New England countryside, and by close cooperation, as a group, with federal and State authorities. Second, to subsidize prices. A mail survey of every New England airport is to be conducted to survey the membership in all fixed base operators.

Schools Keep Pace

Radio courses emphasized to meet more exacting industry demands

ONE OF THE MOST SIGNIFICANT TRENDS in air school curricula is the addition of air greater emphasis on radio courses, which deal both with calculations and maintenance of radio equipment and with navigation by use of radio. This is the result of the greater importance being placed on radio aids by the Bureau of Air Commerce, which will eventually require both standard long distance and radio direction finders aboard scheduled air transport ships.

The Baltimore Aviation School, a division of the Baltimore Aircraft Corporation, Lambert Field, has announced addition of a new month radio course. Joseph W. Winkler, manager of the school, has also announced the addition of the present air radio airplane and engine installation course to be extended to a nine months course.



GOING SCHOLARSHIP WINNER

Howard Bird (right) is given the "Globe" cup as a recent winner at the Boeing School of Aeronautics, Oakland, Cal. His graduation is shown below.



NEW POWER

for the Navy is provided by the experienced army bomber by Eugene Armstrong. It is a Cybersound. Performance figures are not released.

Spring enrollment at Joe Mosser's Grand Central Flying School, Glendale, Cal., is reported at a new high. A relatively high percentage of instruction is now in the field flying and aerial navigation.

Total tuition value of the Boeing School of Aeronautics 1937 at E. Boeing Schoolships will be more than \$11,000. The committee of award met at the Boeing School at Oakland, Cal., April 2 to select the winners. Invited to serve in this committee, which will make the slight annual award, are

Dr. Richard M. Woods, head of the Mechanical Engineering Department, University of California, at Berkeley; William B. Stout, of the State Engineering Laboratories, and Professor Frank Haden, of Purdue.

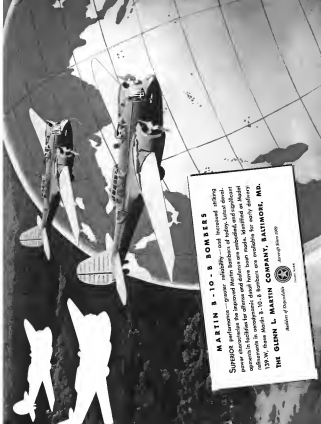
Following the first beginning March 28, Pacific Air College, East St. Louis, Ill., is planning an increase in prices for their various courses, the increase ranging from \$12 to \$22, or a 10 to 20 percent. Reason is that course prices are all-inclusive, taking care of room, board, and equipment as well as tuition, and the general commodity price level has gone up 5 per cent in the last few months.

Thaddeus Woolley, president of the Aeronautical Institute of Los Angeles, has announced the appointment of Ray Jerome, formerly with the Hamilton Aircraft School, as registrar.

Specializing in advanced flight training, instrument flying, radio navigation, and navigation, a new flying school has been established in Chino, Calif., Santa Monica, Cal. Known as Marine Military Aeronautics, the new school has the Stinson backing of Mrs. Edith Daydon "Duck" Clark, wealthy aviation woman pilot.

Walter Borch, chief of ground school instruction at the Ryan School of Aeronautics, San Diego, Cal., has announced the appointment of Vincent Hamilton as director, training and assistant chief metal instructor.

A new aviation course emphasizing crew navigation is being offered by The Stewart Technical Trade School, New York. The course is under the direction of Com. P. V. H. Wason, engineer of the Western System at Newport. It will deal primarily with the application of radio in navigation, and will also include dead



MARTIN B-10-B BOMBERS

SUPERIOR performance—greater reliability—and increased selling power characterize the improved Martin bombers of today. Latest development characteristics for offense and defense are embodied, and significant improvements in facilities for offense and defense have been made. Identified as Model 139-W, these Martin B-10-B bombers are available for early delivery.

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WITH the development of larger ships traveling at greater speeds, the demands upon control cord become more and more severe. By building improved cords to meet the new requirements, Roebbling has a hand in furthering the development of transport flying. Thus, you will find that the majority of plane manufacturers building planes for transport service use Roebbling Aircraft Cord.

Roebbling Wire Aircraft Products are made in Stainless Steel and High Carbon (Tinned or Galvanized) Steel. They include: *Aircraft Wire, Aircraft Braided Aircraft Cord* (No. 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100).

JOHN A. ROEBBLING & SONS COMPANY
TEBENSON, N.J. *Branches in Principal Cities*

flying over California mountains showed no tendency for us to develop at this point, this spring for all time it is believed, say later danger from this source.

Explanation for the crash of a United Air Lines DC-3 into San Francisco Bay Feb. 9 was contained in the cautious verdict of the industry's investigating committee after looking no evidence of structural or mechanical failure, it was concluded that the cause was jumping of the controls by the co-pilot's microphone. It had fallen from its bank at his side into the web of the control column. This conclusion was borne out by a Detroit report dated April 12.

Circus Season—

Buckens and Aerobics break up for busy Spring

BARNUM'S & SONS' ANNUAL NORTHERN AIR CARNIVAL will be held Saturday and Sunday, June 5 and 6 this year. Stadium Aerobics, airport managers, has been released by the Birmingham Aero Club to act as general chairman.

Meets of 61 prominent St. Louis, Mo., men and business organizations, underwritten at a \$50,000 guarantee fund for the International Aerobics Competition and St. Louis Air Race to be held at the St. Louis Municipal Airport, has been announced by the St. Louis Air Race Association, sponsors of the meet. The competition, to be held over the December Day weekend, is to be held by the National Aerobics Association, which has announced the event, to be America's first international aerobics competition.

Contestants will compete for \$25,000 in prizes. Participants in aerobics and the entry list is closed to right. Special rules in aerobics stipulations from 200 to 100 ft. in diameter, with other prizes of from \$2,000 to \$25,000, and trials will also be held for world speed record for fastest victory light plane and for a permanent national speed record trial. The event will be under the direction of James Brown Irving.

Airlines Prepare—
Summer traffic demands more equipment, more schedules, more routes.

THE HIGHEST TREND OF ACTIVITY among the airlines during the month was preparation for greatly increased passenger loads in the same month in some. Several lines are adding

equipment, others extending routes or adding schedules.

After a successful winter of spending at special lowered winter rates TWA will inaugurate on May 1 a new fare structure for the summer months. The winter fares were set on effect last Nov. 1, with a reduction of 17 cents from last summer's base of 61 cents per mile. The new summer fares that year will be figured on the basis of 57 cents per mile, higher than the winter rates, but lower than last summer's. In addition extra charges will be made for a berth or for a direct passage charge. Berth charges will range from \$1.00 to \$2.00 depending upon the distance. Although they did not reduce fares last Fall to meet TWA's, both American Airlines and United Air Lines will now state fares in TWA's same fare level.

How Speed is Shown—May 18, United Air Lines will establish two daily round-trip transcontinental runs. Equipment will be the Douglas Skycopter, Model 40. Only three trips will be made at Chicago, Chicago and Salt Lake City. A third schedule, to start by June 1, will stop at Omaha instead of Chicago. Scheduled time will be 15 1/2 hours.

PCA Schedules—Service to Charleston, W. Va., was announced April 1 by Pan American Central Air Lines, the 120-mile flight between Pittsburgh and Charleston is scheduled for 90 minutes, with stops at Pittsburgh.

Equipment Exchange—A passenger aircraft purchase of 140 per cent has been offered on Boeing Airways, which has purchased five of the 14-passenger Douglas DC-2s from Transcontinental and Western Air.

New Northwest Schedule—Announced April 6 was the purchase by Northwest Air Lines of eight of the new 14-passenger Lockheed 14s, powered with two Pratt & Whitney engines of 850 hp each. Cost will be \$100,000.

Profits Rise—

Thickness 1936 reports show earnings. Two airlines report black ink

HEALTHY RECOVERY and growing day have also indicated by the substantial increase in reports of yearly profits for the industry. In many cases these profits are reported on income per pound. Following is the record of recent annual and quarterly reports.

AMERICAN AIRLINES—Not profit of \$64,043 for the quarter ending Nov. 30. Not sales amounted to \$3,311,361.

PANAMA CANAL COMPANY—Reported \$147,000, or \$142 a capital share, in 1936, compared with \$139,600, or \$147 a share, in 1935.

WARRIOR AIRCRAFT CORP.—1936 profit: \$641, sales a \$1,593 loss in 1935. 1936 sales totaled \$2,000,000.

BOEING AIRCRAFT CO.—Report showed unified profits totaling \$2,311,797 on Dec. 31, 1936, and orders received during January and February of 1937 amounting to an additional \$2,515,248. The 1936 profits were \$1,545,156, compared with a loss of \$1,133,000 in 1935. **WHEELER AIRCRAFT CORP.—**A, and 1936 profit, after taxes, of \$1,007,898. Profit in 1935 amounted to \$423,205.

WARRIOR AIRCRAFT CORP.—Not profit of \$50,000 for the fiscal year ended December 31, last. This showing contrasts with a net loss of \$8,258 for 1935.

CONSOLIDATED AIRCRAFT CORP.—Not income for the year ended Dec. 31, 1936: \$103,415 after taxes, equal to 39 cents a common share, against \$102,214 in 1935, or 36 cents a common share.

LOCKHEED AIRCRAFT—Sales for the first quarter of 1937 about \$1,000,000, or approximately 30 per cent of 1936 sales for the first quarter 1936. Unified orders were reported in excess of \$2,500,000 and at one time during March reached \$3,000,000, a new all-time high.

BALL AIRCRAFT—Not profit for the quarter ending Feb. 28, 1937: \$2,323-78. Sales for the quarter were \$246-45, a new all-time high. **AMERICAN AIRCRAFT—**For 1936, a profit of \$4,389, compared with a net loss of \$441,200 in 1935. Passenger revenues were up more than 50 per cent.

BOEING AIRCRAFT—1936 net income of \$1,023,892, against \$1,144,921 earned in 1935.

GOODYEAR AIRCRAFT CO.—Not profit of \$732,652 in 1936. This is equal to 67 cents a share on each of \$1,093 shares of \$1 per capital stock. The year's net sales totaled \$2,515,274, including \$1,734,340 of foreign deliveries.

CENTRAL AIRCRAFT CORP.—Profit of \$1,027,000, equal to 28 cents a share on 1,133,000 shares of \$1 per share. A stock outstanding.

THE STRICK CORPORATION—Not income for 1936 of \$1,279,358, including a profit of \$1,028,520 on sales of \$1,000,000.

EN-CORP. AIRCRAFT & TOOL CORP.—Not profit for 1936, \$143,214.

TRANSWORLD PRODUCTS, INC.—Not profit, after taxes on \$1,000,000 earnings, \$253,750 for 1936.

KEEPING PACE WITH AN INDUSTRY WHOSE WATCHWORD IS PROGRESS

of Domestic and Export Commercial Airplane Deliveries for Month Ending April 10, 1937. Items preceded by an asterisk (*) were reported for the period Jan. 1-March 30.

[illegible]

^a These insects had been previously reared on diets containing one or more of the following vitamins:

^a *U. indicus* *Adams*

BALANCE
BALANCE

Every blade of a Hamilton Standard propeller is carefully checked for balance against a master weight before it goes to the assembly line. Each blade must be in perfect balance, not only for every position of rotation, but also throughout its entire range of pitch angles. The precision with which this equilibrium is achieved assures interchangeability of blades in the field and dynamic balance in operation.



HAMILTON STANDARD PROPELLERS
EAST HARTFORD, CONNECTICUT
DIVISION OF UNITED AIRCRAFT CORPORATION



A WORTHY OFFSPRING

OF THE FAMOUS "MISTER MULLIGAN"

The New Howard DGA-8

IGNITION BY
SCINTILLA



BENNY HOWARD
Designer of Scintilla

Benny Howard's achievements as a flyer and as a designer of aircraft ribs and receive the admiration of all men who fly. It is a source of gratification to Scintilla that in the new Howard DGA-8, the universal trust of the industry in Scintilla ignition is once more evidenced.

SCINTILLA MAGNETO CO., Inc.

SIDNEY, NEW YORK

(Manufacturers of Spark Arrestor Equipment)

Aviation People

Who's who and what they are doing

✶ Taking vice-presidency in his stride, THOMAS F. WILSON has acquired two within the past month.—of Curtiss-Wright Corporation, and of the Institute of the Aeronautical Sciences, the latter a reelection. Mr. Wilson has been affiliated with Curtiss-Wright and its predecessor subsidiaries since 1925, having had charge of various engineering activities at Curtiss Aeroplane & Motor Company in Garden City and later at Buffalo. Now located at New York headquarters as Director of Engineering activities, three his promotions in that post from vice-president and general manager of the Buffalo Division in 1934, he has transferred in Europe and the Americas to secure a wide perspective for his company in engineering matters. Mr. Wilson is a founder member of the Institute and represented it at the recent meeting of the American Association for the Advancement of Science, where he presented a paper on "Speed-Air: Aerial Propulsion Possibilities?"

✶ Col. J. MARION JORDAN, Assistant Secretary of Commerce, has appointed MAJOR A. B. McWHIRTER of Tuscon, Florida, to succeed JAMES S. WILSON as Chief of the Airport, Marine, and Mapping Section of the Bureau of Air Commerce. (AIRCRAFT, March, p.39) Major McWhirter is familiar with this phase of the Bureau's program through his work as assistant director of the Division of Airways and Airports of the Works Progress Administration. Previously he has been active in developing airports and landing fields in Florida where he served as Director of Aviation until 1932, then Director of the Aviation Division, Florida Works Progress Administration, and Director of Aviation Division, Florida Emergency Relief Administration. During the war he served as an instructor and engine officer at several Army fields in this country.

✶ The re-elected board of directors of United Aircraft Corporation has now re-elected the following officers: President, DENNIS T. BERRY, senior vice-president, ROBERT E. WILSON, vice-president and chief engineering officer, J. MASON, vice-presidents, CHARLES W. DEAN, GEORGE S. WELLS, RAYMOND

WILSON, EUGENIUS W. CLARK, RICHARD T. WILSON, executive vice-secretary, JOSEPH F. MCCARTHY, treasurer, CARROLL L. GARDIN, secretary, FREDERICK E. BOWENHAM.

✶ Names well known in commercial aviation appeared on the outgoing list of the Lockheed company by the French Line to introduce Mr. JEAN BRY, newly appointed Air Division Manager of Air France-French Line. Mr. Bry, who was and former executive of the French Company, has been active in the domain of the present expansion of the various lines operated by Air France. Mr. BRY has been in LAUREL, resident general manager of the French Line, since that Air France and the French Line are making surveys preparatory to the most important flights which they have will take place in the course of a year.

✶ The ranks of aviation passengers were thinned through the death, on March 25, of WILLIAM H. MARTIN, aged 32. In 1938 Mr. Martin obtained the first U. S. patent on the monoplane type of airplane, the principles of which were applied to perfecting the present-day monoplane. The Martin craft was a pioneer, especially noted for being able to maintain level flight in the Smithsonian Museum.

✶ Air Express Division of Northwest Airlines, Inc., will be managed by PAUL R. KANANIAN, now at St. Paul. For the past sixteen years Mr. Kananian has been with Railway Express Agency, now of them in the Air Division.

✶ At the annual representative meeting of the Board of Directors of Smeeth Field, Inc., the following officers were elected: JOHN W. HARRIS, chairman of the board; GEORGE LINDVOLD, chairman of the executive committee; W. D. GORDON, president and treasurer; A. C. KERRICK, vice-president and secretary; W. T. BOWENHAM, assistant treasurer.

✶ First presentation of the Rear Admiral William A. Moffat Memorial Trophy was made to LTJG Robert F. WILSON, in recognition of his service as the U. S. S. Cadmus, a member of the Overseas Squadron Four. The



WILLIAM A. MOFFAT



DONALD L. BRY



WILLIAM H. MARTIN



PAUL R. KANANIAN

trophy, in memory of the late Rear Admiral William A. Moffat, former Chief of the Bureau of Aeronautics, is awarded annually to the knowledge, as greater-based aviation man which has the greatest number of hours during the year with proportionately maximum safety in personnel and equipment.

✶ One of a series of lectures at San Francisco on May 2 to be given by Dr. WILLIAM D. DUBOIS, visiting professor at Stanford University, for his

With the Great Silver Fleet

(Continued from page 25)

smaller detail of ships or of service in given a workload in the satisfaction of all. Requests are made. "You're a 'No,'" says the Captain. Discussion ends, passengers are suggested. But "Let's get this thing settled now," says Kille. That statement, which repeated the language of the meeting.

And the results of such coordination of company problems are visible as the best in the record for safety and performance that led to the granting of the Safety Award by the National Safety Council on April 14. (See News section.)

Now Eastern Air's operating problems are gradually its own. Flying along the Eastern seaboard, serving the metropolitan centers of New York and Chicago with the nation's most popular winter playgrounds, Miami and the South of Florida, its traffic reaches a peak in the time of year when flying conditions all the way North of Jacksonville are far from ideal. The fact that, in spite of an unusually severe winter, it has passed the line into a high average of schedules completed with a perfect safety record speaks well for the skill of the pilot personnel and of the supporting ground services. Two facts, the high passenger demand and high frequency of service necessary on the Washington-New York run has led for an intensive use of flying equipment never before attained in airline operation. Pilots report once a day had been flown between these two points, and planes rolling for 20 or more trips ("Every flower on the line") are prepared for the new tests. Small wonder that the conditions of operation are better at "The Merry Go Round" over the system.

EASTERN AIR LINES' operating history dates back to February 1922 when William Postman through Pioneer Aviation, Inc., was granted a certificate to fly the route between New York and Atlanta, Ga. Shortly afterwards that same year was taken through to Miami. By May 3, 1928, operations over the route were in full swing with 41 employees in the company. On July 16, 1929, operations of Pioneer interests were taken over by the North American Aviation, Inc., but the same Pioneer Aviation was retained until Jan. 17, 1930, when

Eastern Air Transport, Inc., came into existence. On August 16, 1930, with over 3,000,000 miles of flying experience behind it, Eastern Air Transport inaugurated passenger services over its system. North and South were made at first, but were shortly thereafter replaced by a line of Curtiss-Wright Kingbirds and Condors. By early 1931 the line was flying 15,000 scheduled miles per day, had a personnel of 380 employees. New schedules were added steadily until E.A.T. was serving the whole area between New York, Atlanta, and Miami. In April, 1933, as a result of a merger between North American Aviation, Inc. and General Aviation Corporation, control of the company passed to General Motors. It was at this time that Captain Richard L. Smith became associated with the new system. On February 16, 1934 E.A.T. purchased the entire assets of Eastern Lines, the "Merry Go Round" service between New York and Washington. In Oct., 1933, operations were conducted with the re-creation of flying berths in the Curtiss-Condors, then adding Eastern Air Transport the line in the country to offer deeper accommodations.

On February 8, 1934 the blue bell when all U. S. mail contracts were awarded. Just prior to completion, the line included 136 persons among its employees. In April, 1934, a new company, Eastern Air Lines Division of North American Aviation, Inc., was formed to take on the new mail contracts and it is this company that is in existence today operating the territory purchased by E.A.T. In the years that have followed progress has been rapid. All the old Kingbird and Condor equipment has been replaced by the most modern Douglas DC-3s and latest Douglas DC-4s. Lockheed Electras are used on certain local routes.

When American line became interested in the problem of airline maintenance, (1935), we turned naturally to the Navy. It was in fact the Navy who at that time gave across the river in Brooklyn Harold Gifford, then a corps, that a synthetic use to the field of engineering on maintenance problems, made it possible for us to use the system, to visit his own shops, then in Atlanta and the Pan American Base at Miami. But what a con-

tract was the trip to Miami then and now! We made the first trip before the Richmond-Charleston-Jacksonville rail-out was in use. That time was a day and a half via Atlanta, with an overnight stop at that point. And all the way from Washington to Miami is a Kingbird!—with eleven stops! We couldn't help but think of that when we made the New York-Miami trip the other day in seven hours 35 minutes with one stop at Charleston in a DC-3 Verdy, (then have dropped).

BACK in 1931, Eastern Air Transport started something, got a good-looking set on board each plane or "house." Chief idea in those days was to lend a little atmosphere and then, perhaps, distract the attention of the customers from the fact that they were flying through the air. When Coastal Canadian Day came in 1934, the business disappeared from E.A.T., the first of many moves to capture the left to survive the last years. Although practically every other major line in the country collapsed, or has since reorganized, a business system, the airlines E.A.T. then personally related to re-emerge, made the explicit responsibility for looking after the needs of passengers about ship. But with the coming of the new equipment and the trend toward blind flying, the job in the cockpit became complicated enough to require the services of both pilot and co-pilot. Besides, with increasing passenger volume, and the need for leaving a check at intervals on the ship at all times, it became necessary to choose a crew member of the crew was desirable. Again E.A.T. continued as mentioned, is the only domestic airline so far to hire and to train a group of young men as co-pilots instead. Not entirely new, the idea, the Imperial Airways and The American have operated stewardess systems for years, but new enough to cause more than a ripple in U. S. air transport circles. And the results seem to be definitely on the positive side, so far. When like the Flight-Stewardess idea because they say (1) they are more over all the paper work on the ship and expect constant results, (2) the Flight-Stewardess can shoulder a great deal more of the responsibility in handling passengers in minor emergencies, weather conditions, etc., (3) they are better baggage and the heavier jobs about the ship without relying on the pilots for help, and (4) the air line is more efficient. The perspective have been uniformly enthusiastic in their comments. They appear-

(Time to page 32)

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UNITED'S Mainliners

shorten coast-to-coast schedules
four hours and forty minutes.

Four years ago United Air Lines' announcement of twenty-hour flight between New York and San Francisco made headlines. Now their Douglas DC-3 Skylounges and DST's (Sleepers) will make this run in fifteen hours, twenty minutes.

Sperry Gyropilots are installed on all of United's Mainliners.



SPERRY GYROSCOPE CO., Inc.
BROOKLYN — NEW YORK

How High?

(Continued from page 38)

Figure 50, illustrations of which are included in this article. In addition, one of the modern American passenger transports, the Douglas DC-3, is shown on the figure for comparison. Each of the two record-holding ships was equipped with the normal type of four-drive supercharger, although the supercharging was carried to a much higher altitude than usual. In the United States there are many planes in operation which are equipped with exhaust-driven turbo-superchargers. It is characteristic of these units that they are capable of carrying their supercharging up to much higher altitudes than is possible with the gas-driven types because they recover energy which is normally lost through the exhaust of the engine. As a matter of fact, there is so much energy available in the exhaust gases that by selecting the proper design for the turbo-supercharger for any given altitude it is possible to carry the supercharging beyond any altitude to which the conventional surplus of today will fly. Such a unit should certainly be incorporated in the airplane which would establish the altitude altitude record.

Assuming that a turbo-supercharger is used, estimates of the factors governing the maximum altitude have been made and these estimates indicate that 45,000 ft. is the probable limit to which airplanes of the type considered conventional today would ascend. Such airplanes would probably be designed with higher aspect ratios and wing loadings than those previously used in such attempts and would be somewhat slower. Of these improvements it is felt that the gain imparted by the turbo-supercharger and around the increased aspect ratio.

It is interesting also to estimate what might be done in this country to advance the record at the present time. In this regard it must be noted that the United States has a decided advantage over the European nations in the matter of the turbo-supercharger. There are in this country a large number of service airplanes using these units in regular operations while in Europe the turbo-supercharger is apparently still in the experimental stages. For this reason alone it is felt that an airplane could be designed



Q.B.I. (Continued from page 32)

Magnetic frequency bearing of the airplane from the station.

From two or more D.F. (Direction Finding) stations working together, the pilot can be given his bearing and distance from the station.

The three radio stations which give D.F. service in the London-Continental-Almaly Area (Croydon Control) shown in table below.

Beacons are accurate to within 2 degrees. The Croydon long range station on 253 Kcs works with about 15W made power, the short range transmitter on 322 Kcs with about 20 watts made power. The off-voice range of other transmitter however is completely limited, not by distance, but by the number of airplanes that can successfully be worked at any given time.

When QBI is in use, all airplanes approaching Croydon are given their time for landing and must obey instructions from the Control. It will be seen therefore that in addition to giving positions, Croydon has to exercise a definite control over the position—height and speed—of all planes in the Croydon controlled area and is responsible for the avoidance of collisions.

It does seem that the principle of directing divisions—given from Area and Almqst control as is practiced in the U.S., is fundamentally correct and some improvement will have to be made here for additional frequencies to be available so that the same principle can be followed, though it is not always likely that directional radio range control will be adopted, but rather a number of semi-directional radio beacons on which the airplanes themselves will take bearings by means of proper D.F. equipment—

noting loops etc. The actual control of position will then be dependent and on a different frequency.

Whether it is desirable for the Airline Companies to control the movements of their own planes with their own radio stations, subject of course to the authority of the Army and Air Force Command, is again dependent largely on available frequencies.

Weather Report Service. Weather reports weather forecasts and air-weather observations are broadcast from the Air Ministry meteorological Radio Station at Heathrow H.R., Wokingham, Hampshire, on a frequency of 254 Kcs (3185 meters) daily. The report stations from which weather information is received are graded as AEEV stations. VADZ Stations and ALIN RELAY Stations and are issued all over the country. Broadcasts which are arranged as far as possible for the stations along the principal air routes, are as follows: (a) during the day, and reports from KEY stations are transmitted 15 minutes after each hour from 7 a.m. to 6 p.m.; from Main Stations at 30 minutes after the principal hours of observation 7:30 a.m.; 1, 4, and 6 p.m.; and from auxiliary stations two or three times a day.

The current report for Croydon Airport is broadcast every quarter-hour from Croydon Airport Radio Station on 5, 26, 35, and 50 minutes after each hour from 7 a.m. to 10 p.m. by C.W. telephony on 325 Kcs (923 meters).

Wind Approach and Landing Substation. A short wave landing approach system known as the V.H.F. (Very High Frequency) is available at Heston Airport, and a Landing Installation

which conforms to the same general principles is now available at Gatwick. For the short beacon a frequency of 35.65 megacycles (923 meters) and for the same and outer marker beacon 35.80 megacycles (759 meters). The outer and inner marker beacons are two miles apart, must be spaced at not less than 650 feet and 110 feet respectively, the outer marker beacon being just inside the airport boundary.

Substation from the main beacon is into two stations—South and North—beacons go into the Northern sector, but the South, the spot-beacon being 40 miles towards the East. The Outer Marker beacon radiates twice per second a signal modulated at a frequency of 700 cycles a second. The Inner Marker beacon radiates six times a second a signal modulated at a frequency of 1,500 cycles a second. It is stipulated in the Air Ministry Notice to Airmen in which a description of the System is given, that the establishment is to assist landing approaches when the vertical visibility is not less than 40 meters—120 feet—and that permission to enter the controlled Zone must first be obtained from the Airport Control, with whom two-way communication must be maintained while landing.

Few airplanes have the equipment for making a blind approach, and the system has been suggested that as the blind approach path to Gatwick lies over the railway which is carried on the top of an embankment forming the eastern boundary of the airport, it is quite possible for an airplane making a low level blind approach to view all over or more railway tracks on the way in. But all new airplanes must contain and time alone will tell.

L. A. Show

(Continued from page 32)

with a recorded story of modern air transport operations, further enhanced public interest in the Douglas display. Beautifully exhibited, the Lockheed Model 12 drive equal attention and the crowd was entertained with a continuous motion picture presentation of Lockheed production methods. Nearly was the new Waterman Arrowbile (see page 32) which never failed to attract attention. Waterman exhibited the new Arrowbile, a successful moving picture, a portable lecture over a public address system, and a twice daily demonstration of (Turn to page 32)



THE achievement of American Airlines in being the world's first airline to carry 1,000,000 passengers is a record as which the entire United States may well be proud.

It is your record, after all.

Men, machines and machines, have striven successfully to make this record possible and to use it to that American aviation taps the world. But only because of the confidence which 1,000,000 of you have placed in commercial aviation and in the outstanding service which American Airlines offers has this signal record been achieved.

To you, and to American Airlines, Douglas expresses its sincere congratulations. Douglas Aircraft Company, Inc., Santa Monica, California.

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IN THE ORIENT: — AIRWAYS AIRWAYS, China National Aviation Corporation, and K.W.I.L. in the Netherlands Indies.



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Proof of this is the fact that more hours between and overpowered hours now over 1000-1500 hours of the R-680-D engine at all times makes of 4-5 in engine class planes combined and that again because General and Lycoming have tested more than 6,000,000 miles in the last quarter of 1951 without an accident which resulted in a failure in plane or passenger.

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Advertising: \$2450.00
Editorial: \$1225.00
Business: \$270.00
Library: \$270.00
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Editorial: \$1250.00
Business: \$275.00
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Business: \$290.00
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Advertising: \$2700.00
Editorial: \$1350.00
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Advertising: \$2750.00
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Library: \$300.00
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Business: \$335.00
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Editorial: \$1575.00
Business: \$340.00
Library: \$340.00
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Editorial: \$1600.00
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Advertising: \$8150.00
Editorial: \$4075.00
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Library: \$840.00
Advertising: \$8200.00
Editorial: \$4100.00
Business: \$845.00
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Advertising: \$8250.00
Editorial: \$4125.00
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Library: \$850.00
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Editorial: \$4150.00
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Library: \$855.00
Advertising: \$8350.00
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Library: \$870.00
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Library: \$875.00
Advertising: \$8550.00
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Advertising: \$9350.00
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Advertising: \$9750.00
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Advertising: \$10300.00
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Advertising: \$10350.00
Editorial: \$5175.00
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Editorial: \$5200.00
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Advertising: \$10750.00
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Advertising: \$10800.00
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Advertising: \$10900.00
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Editorial: \$5600.00
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Advertising: \$12000.00
Editorial: \$6000.00
Business: \$1225.00
Library: \$1225.00
Advertising: \$12050.00
Editorial: \$602

Circle 100 on Reader Service Card

1964 1/2 Plymouth owned Dennis Williams, 1000 N. 10th St., Phoenix, Ariz. 85012. Call 442-1111. 1964 1/2 Plymouth owned Dennis Williams, 1000 N. 10th St., Phoenix, Ariz. 85012. Call 442-1111. 1964 1/2 Plymouth owned Dennis Williams, 1000 N. 10th St., Phoenix, Ariz. 85012. Call 442-1111.

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"Classified" INDEX

PLANE, ENGINE, PARTS FOR SALE
Aeronautics in the marketplace are now more than ever before. The following is a list of classified items for sale or service. Items are listed in alphabetical order by category. Items are listed in alphabetical order by category. Items are listed in alphabetical order by category.

Products

1964 1/2 Plymouth owned Dennis Williams, 1000 N. 10th St., Phoenix, Ariz. 85012. Call 442-1111. 1964 1/2 Plymouth owned Dennis Williams, 1000 N. 10th St., Phoenix, Ariz. 85012. Call 442-1111. 1964 1/2 Plymouth owned Dennis Williams, 1000 N. 10th St., Phoenix, Ariz. 85012. Call 442-1111.

Services

1964 1/2 Plymouth owned Dennis Williams, 1000 N. 10th St., Phoenix, Ariz. 85012. Call 442-1111. 1964 1/2 Plymouth owned Dennis Williams, 1000 N. 10th St., Phoenix, Ariz. 85012. Call 442-1111. 1964 1/2 Plymouth owned Dennis Williams, 1000 N. 10th St., Phoenix, Ariz. 85012. Call 442-1111.

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WE TRAIN AND PLACE ENGINEERS, DESIGNERS AND MECHANICS

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 1000 W. 10th St., Los Angeles, Calif. 90015

PILOTS

1000 W. 10th St., Los Angeles, Calif. 90015

WHERE TO BUY

NEW EQUIPMENT—ACCESSORIES—MATERIALS—SUPPLIES

STREAMLINES

Coverings and Wood Posts
 Metal Spacing Steel Metal Spacing
 HILL AIRCRAFT STREAMLINES CO.
 1000 W. 10th St., Los Angeles, Calif. 90015

NO-CUT

WOOD CLAMPS
 1000 W. 10th St., Los Angeles, Calif. 90015

STANDARD AIRCRAFT FINISHES

1000 W. 10th St., Los Angeles, Calif. 90015

TITANITE

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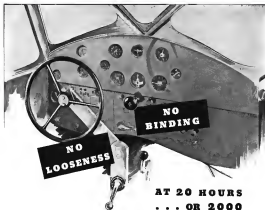
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